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Guidelines for the Safe Use of Pesticides by Farmers

Crop Protection Branch

Introduction

Pesticides play a major role in controlling agricultural pests in Alberta and in helping to maintain high yields for farmers. For the last few years, however, farmers have become increasingly concerned about what effects continuous exposure to these chemicals may have on their health.

Each pesticide undergoes extensive testing to determine its **potential hazard** to humans. A **pesticide label** is then drawn up which outlines the hazards of the pesticide and the type of safety equipment to use to reduce the hazards. **Yet, few farmers are aware that this information exists on the label.** The perception among most farmers is that the tests are done, the product is registered, and hence the pesticide is safe to use providing you are not too careless. What everyone should realize, however, is that the pesticide is safe to use only if the **precautions** for handling the product are followed and recommended **safety equipment** is used.

These guidelines point out some of the tests which are done to identify the hazards of a pesticide, what to look for on the label to determine the hazards, what type of first aid measures can be given if poisoning occurs, and how to protect yourself against exposure to pesticides.

Tests to determine hazards

Several tests are done to determine the hazards of a pesticide to humans. Since experiments cannot be done on man, however, animals such as mice, rats, dogs and rabbits are used and the results are extrapolated to man.

The tests are designed to determine what the **toxicity** of a pesticide is, and if the chemical has the potential to cause birth defects, cancer, tumors, gene damage, or to have reproductive effects.

The toxicity of a pesticide is its ability to cause immediate and severe injury to man and is expressed as the LD_{50}. The LD_{50} is the one single amount of the pesticide that will kill 50 per cent of a group of test animals orally or dermally exposed to the pesticide. For example, if there are 20 rats in the test group, and each animal is dermally exposed to one fixed amount of a pesticide, the amount that kills ten rats is the LD_{50} of that pesticide. From this it can be seen that the lower the amount of pesticide required to kill 50 per cent of the rats, the lower is the LD_{50}. **The lower the LD_{50}, the more toxic is the pesticide and the greater the hazard to humans.**

The LD_{50} is usually measured as the amount in milligrams of the formulation per kilogram of body weight of the animal. For example, a dermal LD_{50} of 500 mg/kg means that 50 per cent of the test animals died when each one was exposed to 500 milligrams of the formulation for every kilogram of body weight of the animal.

The following table gives an idea of the toxicity and danger of a pesticide if you know oral or dermal LD_{50} to rats.

Oral LD_{50} Value (mg/kg)	Dermal LD_{50} Value (mg/kg)	Toxicity	Danger
less than 500	less than 1000	very high	very dangerous
500-1000	1000-2000	slightly high	slightly dangbrous
1000-2500	2000-5000	low	not very dangerous
greater than 2500	greater than 5,000	very low	not dangerous

The safe handling and use of pesticides require that you know how toxic the pesticide is (i.e. the LD_{50}), how the product should be handled, and what safety measures you should take to ensure you and other people are not overexposed to it.

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How to determine pesticide danger from the label

The LD_{50} of a pesticide is not given on the pesticide label. However, the label contains valuable information which can help the farmer determine the hazards of a pesticide, and outlines precautions which should be taken when using the product.

Instead of the LD_{50}, a sign identifies the degree of hazard on a pesticide label. For example, a label with **skull and crossbones in the octagon or 'stop' sign** indicates that the pesticide is very dangerous and poisonous (Figure 1a). Pesticides with oral LD_{50}s less than 500 mg/kg of body weight or dermal LD_{50}s less than 1000 mg/kg usually carry this sign. The protective equipment which is recommended for this group of pesticides includes a respirator with pesticide-absorbing filters, chemical goggles to protect the eyes, and rubber or neoprene gloves. These items are to be worn in addition to your standard clothing of long pants, long-sleeved shirt, and cotton or polyester-cotton or Tyvek coveralls. The information under the heading PRECAUTIONS on the label will spell out the type of safety equipment required.

The second sign usually seen on the pesticide label is the **four-sided diamond with the skull and crossbones** (Figure 1b). Pesticides with oral LD_{50}s of 500-1000 mg/kg and dermal LD_{50}s of 1000-2000 mg/kg will carry this sign. These pesticides are poisonous but are less dangerous than the previous group. Goggles are recommended for these pesticides, and farmers are advised to take precautions to reduce exposure when handling or spraying. A respirator may be required if the pesticide is mixed in enclosed areas.

Pesticides which have oral LD_{50}s between 1000 and 2500 mg/kg or dermal LD_{50}s between 2000-5000 mg/kg have a **skull and cross-bones sign surrounded by a triangle** (Figure 1c). These pesticides are not toxic but farmers are advised to prevent excessive skin, eye or inhalation exposure.

The skull and crossbones can be replaced by other symbols depending on the type of hazard (Figure 2).

Pesticides with LD_{50}s greater than 2500 mg/kg (oral) or 5000 mg/kg (dermal) have no symbols indicating that they are nontoxic and nonhazardous.

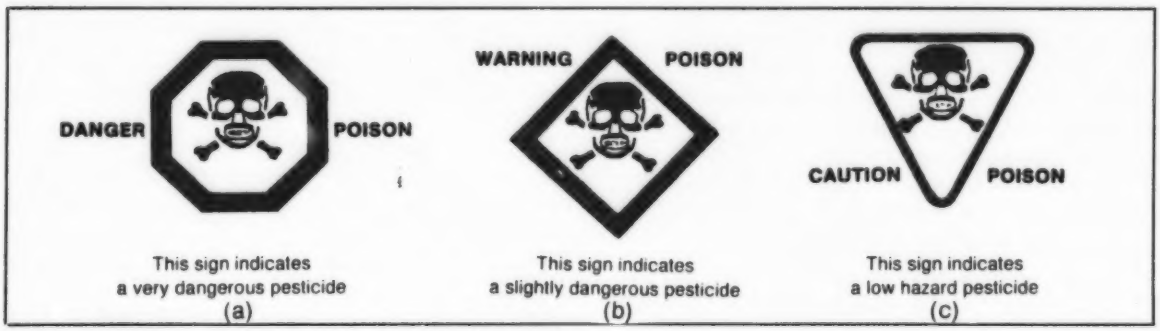

Figure 1. Signs on pesticide label indicating hazards.

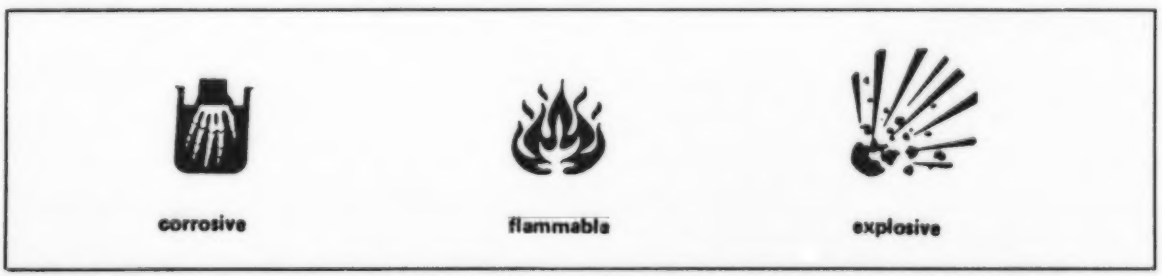

Figure 2. Some signs other than skull and crossbones which can be used depending on the hazard.

All pesticides may not produce symptoms of poisoning after use, but some may cause injury to health after several years of repeated exposure. **Farmers are therefore advised to take measures to cut down on exposure to all pesticides regardless of their toxicity. Know the hazard sign on the pesticide label and wear the safety equipment required.**

Insecticides, herbicides, fungicides

The pesticides most used by Alberta farmers fall into three major categories: **insecticides, herbicides** and **fungicides**. Insecticides are designed to kill insects, herbicides to kill weeds, and fungicides to control fungi that cause plant diseases.

Insecticides may be referred to as **animal poisons** whereas herbicides and fungicides may be described as **plant poisons**. Because man **belongs to the animal class**, insecticides have the potential to poison him much more severely than do the herbicides and fungicides. Thus insecticides are usually more dangerous to man than the plant poisons.

Herbicides and fungicides are designed to disrupt cell and plant growth - for example, some interfere with photosynthesis and root growth. Since animals do not have these plant characteristics, herbicides and fungicides have moderate to low poisoning potential to man. A high amount of a herbicide may have to be absorbed into the body before any symptoms may be seen. However, herbicides and fungicides may cause health problems many years later and should not be treated as though they are totally nonhazardous. Avoid exposure as much as possible by using common sense.

Cholinesterase test

The cholinesterase enzyme is found in the blood and can be collected and tested to determine your cholinesterase level.

Persons who work with insecticides for an extended period of time should establish a regular cholinesterase testing program with their doctor. One or two initial cholinesterase tests should be done in the off season perhaps in January or February, to determine the person's base line level. During the summer when the insecticides are being used, similar tests should periodically be done on the individual and the results compared with the baseline level. **Any significant decrease in the level indicates that overexposure to insecticides has occurred.** The person should stop applying insecticides until his/her cholinesterase level is back to near normal.

In case your doctor is not aware of the cholinesterase test, further information can be requested from The Director, Laboratory Services Branch, Workers' Health, Safety and Compensation, 2nd Floor, 10158-103 Street, Edmonton, Alberta, T5J OX6, (403) 427-7989.

Symptoms of pesticide poisoning

Because most **insecticides** affect the nerves, the symptoms produced are related to an **abnormal** functioning of the nerves. The most commonly reported symptoms are headache, blurred vision, pin-point pupils, and secretions in the breathing passage. More severe poisoning results in nausea, vomiting, muscle weakness, difficulty in breathing, mental confusion, and convulsions. Symptoms of insecticide poisoning may begin a few hours after exposure to the chemical. Onset of most symptoms should occur within 12 hours following the end of exposure.

The symptoms of **herbicide** and **fungicide** poisoning may be due more to the hydrocarbon and kerosene solvents in the formulation than to the pesticide ingredient itself. These symptoms resemble those of a flu and include itchy nose, eyes and throat, watery eyes, sneezing and coughing, headache and nausea.

First aid measures

If someone, such as a child, accidentally swallows some pesticide **you should not** automatically assume you have to get the person to vomit. Read the label under "FIRST AID INSTRUCTIONS" to determine whether or not to induce vomiting. If the label recommends vomiting, **induce it at once by giving 2 tablespoons syrup of ipecac**. If syrup of ipecac is not available, give the person plenty of water and stick your finger down the throat. Salt water is no longer recommended as a method to induce vomiting because death may occur from salt overdose. Get the person to a doctor immediately and take the pesticide container which has a label with you.

If the label does not recommend vomiting, **do not induce vomiting**. It is usually better to leave the chemical in the person's stomach rather than induce vomiting and risk injuring the person even more. Get medical attention as quickly as possible. **Never induce vomiting or give anything to drink to an unconscious person.**

How to prevent exposure to pesticides

Since pesticides enter the body mainly through the skin and some pesticides can cause acute health problems, farmers should take steps to reduce exposure. Exposure can occur while mixing concentrated dusts and powders outside the sprayer, when pouring liquids into the sprayer tank, or while spraying the dilute material. Exposure can also occur when mixing pesticides with seed or handling treated seed.

1. **What to wear at all times:**
   A long-sleeved shirt, long pants, cap and boots should be worn all the time. Cotton or polyester-cotton or Tyvek coveralls should then be worn over

your clothes. This leaves very little skin exposed to the chemicals.

2. **What not to wear:**
Do not wear cloth or leather gloves, leather shoes or sneakers. These materials absorb pesticides and as a result your skin would continually be exposed to the chemicals on them.

3. **How to protect the hands, eyes, nose and mouth (Figure 3):**
When opening pesticide containers and pouring the chemical into the sprayer tank, use a pair of rubber or neoprene gloves to avoid getting chemicals on the hands. If the pesticide is an eye irritant, use goggles to protect the eyes. Goggles should have vents to prevent fogging. If the pesticide is very dangerous, as indicated by the sign on the label a respirator should be worn to protect the nose and mouth. Respirator cartridges should be those which absorb pesticides; ask for them specifically. If pesticide gets inside your gloves or boots, wash off shortly afterwards with soap and water. If pesticide gets into the eyes, wash with clean water for 15 minutes and see a doctor shortly afterwards. Take along the pesticide container which has a label.

Figure 3. Some safety equipment which should be used while handling and using pesticides: respirator, gloves, goggles, coveralls.

4. **What to avoid:**
Stand upwind when mixing or pouring pesticide to avoid inhaling chemical. Don't drink, eat, or smoke while using pesticide. Don't use your mouth to clean out clogged nozzles. Don't mix seed and chemicals with your bare hands; wear a pair of rubber or neoprene gloves.

5. **Clean-up:**
Shortly after use, wash gloves with warm soapy water to prevent the chemical from penetrating the gloves. At the end of the day's work, wash all safety equipment with warm soapy water. Remove filters before washing respirator. Dry all equipment immediately. Store respirator with cartridges in a sealed plastic bag. Wash coveralls separate from other clothes. First pre-soak the clothing, then wash with hot water and heavy duty detergent. Line dry clothes.

6. **Where to buy safety equipment:**
Safety Supply Co. - Edmonton, Calgary, Lethbridge, Grande Prairie, Medicine Hat, Fort McMurray, Red Deer; **Malkin and Pinton** - Edmonton, Calgary; **Levitt Safety** - Edmonton, Calgary, Fort McMurray; **Fleck Bros.** - Edmonton; **all UFA store outlets.**

7. **What to do if you are ill after spraying:**
Take the labelled pesticide container to the nearest doctor along with the emergency telephone numbers listed below.

8. **Emergency telephone numbers:**
The emergency department of most hospitals can deal with pesticide poisoning. However, poison information and treatment can be obtained from four hospitals that are fully equipped to deal with such cases.
These four hospitals are:
University of Alberta Hospital, 83 Avenue & 112 Street, Edmonton, Alberta, 432-8432.
Royal Alexandra Hospital, 10240 Kingsway Avenue, Edmonton, Alberta, 477-4444.
Calgary General Hospital, Calgary, Alberta, 262-5892 (Poison Control), 268-9625.
Foothills Hospitals, 1403 -29 Street N.W., Calgary, Alberta 270-1315.
Some pesticide manufacturers have on their labels emergency telephone numbers to call in case of poisoning involving only their products. Some of them are:
Union Carbide — 1-514-645-5311
Monsanto Canada Inc. — 1-314-694-1000
Chemagro Products — 1-416-625-5280
Cyanamid Canada Inc. — 1-416-356-8310
Chipman Inc. — 1-416-643-4123 (6:00 - 2:45 p.m.)
1-416-528-6671

9. **Pesticide Poison Manual:**
All active treatment hospitals and health units have a pesticide poison manual which physicians can use to treat patients.

This information compiled by M. Hussain, Alberta Agriculture, Edmonton.

Additional copies of this publication are available from district offices and the Print Media Branch, Alberta Agriculture, 7000-113 Street, Edmonton, Alberta, T6H 5T6.